



Performance in science on the Minnesota Comprehensive Assessments—Series II for students in grades 5 and 8



Summary





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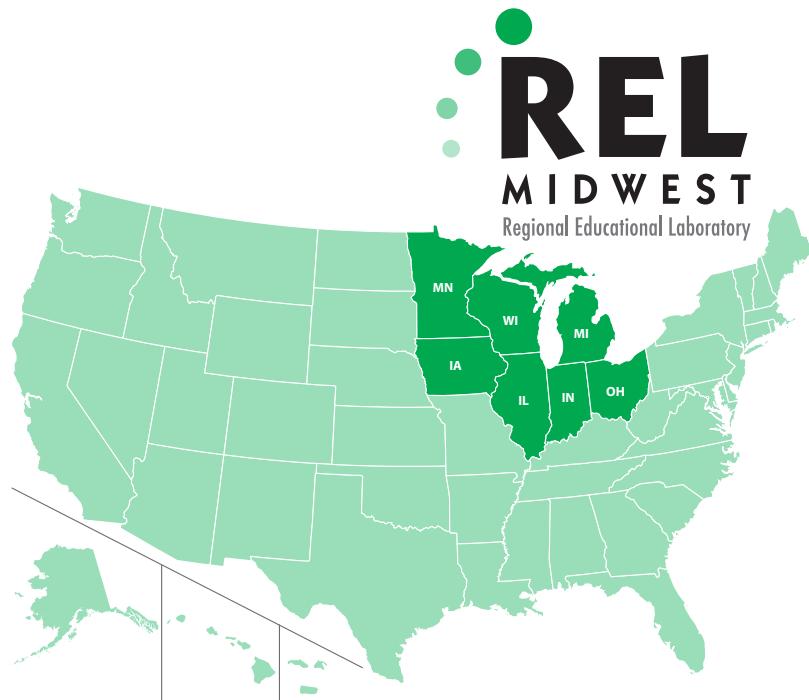
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This study of statewide performance on the 2009/10 Minnesota state science assessment in grades 5 and 8 found that most of the variation in test scores was associated with demographic differences among students. Average performance differed by gender, eligibility for free or reduced-price lunch, special education status, and race/ethnicity.

Policymakers in Minnesota have made assessing and improving student science performance a priority (Minnesota High Tech Association 2010a,b). Minnesota has supported several statewide initiatives to promote science, technology, engineering, and math (STEM)—including a grant from the National Governors Association to increase science learning opportunities, align K–12 STEM education requirements with postsecondary workplace expectations, improve the quality and quantity of STEM teachers, benchmark standards, and identify best practices in STEM education (National Governors Association 2007). To gauge student progress toward the state’s academic science standards, the Minnesota Department of Education introduced the Minnesota Comprehensive Assessments—Series II (MCA-II) science assessment in 2008.

Regional Educational Laboratory Midwest responded to a request by the Minnesota

Department of Education to study elementary and middle school science achievement. The current study addresses three research questions:

- How does student achievement on the 2009/10 MCA-II science assessment in grades 5 and 8 differ by student demographic characteristics?
- How does schoolwide achievement on the 2009/10 MCA-II science assessment in grades 5 and 8 relate to school characteristics?
- To what extent do school characteristics explain differences in student achievement on the 2009/10 MCA-II science assessment in grades 5 and 8, after accounting for the influence of student characteristics?

This study used data for 51,510 grade 5 students in 786 schools and 52,421 grade 8 students in 469 schools. Five student demographic characteristics were considered: gender, eligibility for free or reduced-price lunch, special education status, race/ethnicity, and prior-year academic achievement. The school characteristics examined were based on student composition and teacher composition. The school characteristics based on student characteristics were the percentages of female students, students eligible

for free or reduced-price lunch, students identified as limited English proficient, students identified for special education services, and White students. The school characteristics based on teacher characteristics were the average years of teacher experience, the percentage of full-time equivalent credits¹ taught by teachers with a master's or doctoral degree, and the average student-teacher ratio.

Students' levels of science achievement depended on their demographic characteristics for both the grade 5 and grade 8 assessment:

- Students who were not identified for special education services scored higher than students who were.
- Students who were not eligible for free or reduced-price lunch scored higher than students who were.
- White students scored higher than students of other racial/ethnic groups.
- Male students scored higher than female students.

Eight of the nine school characteristics examined were related to schoolwide science achievement:

- Science achievement tended to be lower in schools with higher percentages of students eligible for free or reduced-price lunch, limited English proficient students, students identified for special education services, and non-White students.
- Science achievement tended to be higher in schools that had more experienced

teachers, higher percentages of teachers with an advanced degree, larger student-teacher ratios, and higher levels of prior-year academic achievement.²

- Science achievement tended to be higher in schools with a higher proportion of female students in grade 8, but this relationship was not observed in grade 5.

About 80 percent of the variation in students' scores (79 percent in grade 5 and 84 percent in grade 8) was due to differences among students within schools; differences between schools accounted for the remaining variation. However, after accounting for student-level characteristics, the school characteristics examined explained less than 3 percent of the variation between schools (2.1 percent in grade 5 and 2.7 percent in grade 8). For both grades, after accounting for student characteristics, science achievement tended to be higher in schools with a smaller percentage of students eligible for free or reduced-price lunch and a larger percentage of White students.

Specifically, the following results were evident for both grades:

- A 1 percentage point increase in the percentage of White students was associated with an estimated increase in science assessment scores of 3.24 percentage points in grade 5 and 2.31 percentage points in grade 8.
- A 1 percentage point increase in the percentage of students eligible for free or reduced-price lunch was associated with an estimated decrease in science assessment scores of 2.33 percentage points in

grade 5 and 2.65 percentage points in grade 8.

None of the school characteristics based on teacher composition examined in this study were related to student science achievement after other student and school characteristics were accounted for.

This report provides Minnesota policymakers with insights into factors related to science achievement, as measured by the MCA-II. The analyses examine patterns of achievement but do not explain why the patterns occur. The findings identify demographic subgroups in Minnesota (such as non-White students and students eligible for free or reduced-price lunch) that could benefit from more intensive support in science. Findings are consistent with research by Stewart (2008) and Konstantopoulos (2006).

Differences in science achievement between limited English proficient students and those who are not limited English proficient could

not be examined because of high levels of missing test data for limited English proficient students. Further, the study could examine only a limited set of school characteristics based primarily on student and teacher composition. The state might consider examining school characteristics related directly to science education, such as course and program offerings, science teacher performance, science teacher preparation and experience, and resources to support science instruction.

Notes

1. Full-time equivalent credits represent the amount of time per week a teacher is reported in a teaching assignment.
2. The student-teacher ratio is the average number of students per teacher in each school. In this study, student achievement tended to increase with the number of students per teacher. However, this could have been due to schools with more struggling students decreasing their class sizes to improve student achievement.

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